STORAGE DEVICE FOR OPTICAL STORAGE MEDIA

FIELD OF THE INVENTION

[0001] The present invention relates to storage devices, and more particularly to storage devices for optical storage media.

BACKGROUND OF THE INVENTION

[0002] Optical storage media such as compact discs (CDs), digital versatile discs (DVDs), and optical media for future data formats store digital content such as music, video, still pictures, software and other data. Playback devices such as CD players/recorders, DVD players/recorders, computers, and gaming devices use a laser to read back digital content that is stored on the optical storage media. Optical storage media such as CDs and DVDs are meant to be stored in jewel cases or other protective storage devices such as CD and DVD wallets and/or albums. However, users tend to leave the optical storage media outside of the jewel cases or other protective storage devices.

[0003] For example, uncased CDs are often left sitting in a vehicle, on top of a computer desk and/or near an entertainment center where they are played. When the user removes the CD from the player, it takes time to locate the correct jewel case for the CD. During busy times, it may be inconvenient to locate the correct jewel case or other protective storage devices. Sometimes, a user will temporarily store the CD in the incorrect jewel case, which often makes it difficult to find the CD later. As a result, the CDs may be left unprotected, stacked on top of each other, etc. The failure to properly care for the CDs may damage the CDs. In

addition, the loose CDs may clutter the area around the computer desk or entertainment center. It also may be difficult for the user to locate a particular CD quickly.

[0004] Referring now to FIG. 1, an exemplary optical medium 10 is shown. CDs typically have a diameter of 120 mm and a center hole having a diameter of 15mm. Data is usually stored from a radius of 25mm (after a lead-in portion) to a radius of 58mm (where a lead-out portion begins). The data on the CD is divided into three areas. The lead-in portion (from radius 23 mm to 25 mm) contains digital silence in the main channel and a Table of Contents in a subcode Q-channel. The lead-in portion also allows a laser pickup head of the playback device to synchronize before the start of a program portion. The length of the lead-in portion may vary. The lead-in portion provides sufficient space for the Table of Contents, which may include up to 99 tracks.

[0005] The program portion (from the radius at 25mm to the radius at 58 mm) contains data that divided into tracks. A lead-out portion contains zero data and defines the end of the program portion. Optical media is typically rotated at a constant linear velocity (CLV). The angular velocity (rpm) reduces from the lead-in portion to the lead-out portion. In other words, pits retain the same geometry wherever they reside on the CD.

SUMMARY OF THE INVENTION

[0006] A storage device according to the present invention for optical media comprises a body defining an upper surface. A plurality of adjacent slots

formed in the upper surface of the body extend in a first direction from the upper surface and define upper guiding cavities and lower engaging cavities. The upper guiding cavities guide optical media into the lower engaging cavities, which have openings to the upper cavities. The lower engaging cavities engage lower arcuate portions of the optical media.

[0007] In other features, the lower engaging cavities independently support the optical media in the adjacent slots in a parallel relationship when the storage device is located on a flat supporting surface. The lower engaging cavities have a trapezoidal-shaped cross section. The plurality of slots are generally parallel to each other.

[0008] In still other features, a first width of the upper guiding cavities generally decreases with a depth of the upper guiding cavities. A second width of the lower engaging cavities generally decreases with a depth of the lower engaging cavities. A third width of the lower engaging cavities adjacent to the opening is greater than a fourth width adjacent to a bottom surface of the lower engaging cavities. The fourth width is between 1.25mm and 1.5mm. The slots are spaced at a fifth width that is greater than 10mm and less than 25 mm.

[0009] In yet other features, the upper cavities have a generally "U"-shaped cross section. The optical media includes at least one of compact discs and digital versatile discs. Opposite sides of the body include a generally "C"-shaped recess. Opposite side walls of the trapezoidal-shaped cavities are sloped at an angle that is greater than 0º relative to a line that is perpendicular to the flat supporting surface. The lower engaging cavities have a depth that is between

10mm and 14 mm at a center of the body and wherein the depth decreases towards opposite sides of the body.

[0010] Further areas of applicability of the present invention will become apparent from the detailed description provided hereinafter. It should be understood that the detailed description and specific examples, while indicating the preferred embodiment of the invention, are intended for purposes of illustration only and are not intended to limit the scope of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] The present invention will become more fully understood from the detailed description and the accompanying drawings, wherein:

[0012] FIG. 1 is a perspective and cross-sectional view of an exemplary optical medium;

[0013] FIG. 2 is a perspective view of a first storage device for optical media according to the present invention;

[0014] FIG. 3 is a plan view of the first storage device of FIG. 1;

[0015] FIG. 4 is a side view of the first storage device of FIG. 1;

[0016] FIG. 5 is an end view of the first storage device of FIG. 1;

[0017] FIG. 6 is a side view of the first storage device of FIG. 1 that stores optical media;

[0018] FIG. 7 is a perspective view of a second storage device for optical media;

[0019] FIG. 8 is a plan view of the second storage device of FIG. 7;

[0020] FIG. 9 is an end view of the second storage device of FIG. 7 storing an exemplary optical medium;

[0021] FIG. 10 is a side view of the second storage device of FIG. 7 storing optical media;

[0022] FIG. 11 is a cross sectional view of the second storage device of FIG. 7 storing optical media;

[0023] FIGs. 12A and 12B show enlarged cross sectional views of slots; and

[0024] FIGs. 13A and 13B show a contact region for the storage devices in FIGs. 1 and 7.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0025] The following description of the preferred embodiment(s) is merely exemplary in nature and is in no way intended to limit the invention, its application, or uses. For purposes of clarity, the same reference numbers will be used in the drawings to identify similar elements.

[0026] Referring now to FIGs. 2-6, a storage device 20 for storing optical storage media according the present invention is shown. The storage device 20 includes a body 22 having an upwardly facing surface 24, end surfaces 28 and 30 and side surfaces 32 and 34. The end surfaces 28 and 30 have lower edges 38 and 40, respectively, that are generally parallel to each other and that abut a flat supporting surface 50 (FIG. 5) such as a table, play back device or other surface when the storage device 20 is placed thereon. In one implementation, the side

surfaces 32 and 34 have generally "C"-shaped recesses 46 and 48 to reduce the amount of material that is required to produce the storage device 20. However, the side portions 32 and 34 may optionally extend to a plane defined by the flat supporting surface 50.

[0027] The storage device 20 defines a plurality of slots 44-1, 44-2, 44-3, ... 44-N (collectively slots 44), which are arranged in a generally parallel relationship. Each slot 44 is adapted to receive an optical medium 10 such as a CD, DVD, and optical media having future data formats. As will be described further below, the slots 44 support the optical media 10 in a spaced apart relationship. The slots 44 are preferably spaced apart by a sufficient distance to allow the user to easily grab the optical medium 10 without grabbing or otherwise disturbing the optical media 10 stored in adjacent slots. In one embodiment, the slots are spaced between 10 mm and 25 mm apart. In a preferred embodiment, the slots are spaced 15 mm to 18 mm.

[0028] The slots 44 define an upper generally "U"-shaped cavity 60 and a lower trapezoidal-shaped cavity 64. The "U"-shaped cavity 60 has a width that decreases with the depth of the "U"-shaped cavity 60. The lower trapezoidal-shaped cavity 64 also has a width that decreases with the depth of the lower trapezoidal-shaped cavity 64. The lower cavity 64 has a depth of approximately 2 mm. In one embodiment, side walls of the lower trapezoidal-shaped cavity form an angle with respect to a line perpendicular to the plane 50 that is greater than 0º and less than 5º. In a preferred embodiment, the angle is greater than 0º and less than 1º. In the embodiment in FIGs. 2-6, the angle is 0.5º. The angled side walls reduce the

likelihood that the optical media 10 will get stuck in the lower trapezoidal-shaped cavity 64. The angled sidewalls also facilitate removal of the storage device from a mold when the storage device 10 is produced.

[0029] Referring now to FIGs. 7-10, a perspective view of a second storage device 100 for optical media is shown. The storage device 100 includes a body 102, upwardly facing surface 124, end surfaces 128 and 130 and side surfaces 132 and 134. The end surfaces 128 and 130 have lower edges 138 and 140, respectively, that are generally parallel to each other and that abut a flat supporting surface 150 (FIG. 10). In one implementation, the side surfaces 132 and 134 have generally "C"-shaped recesses 146 and 148. However, the side portions 132 and 134 may extend to a plane defined by the flat supporting surface 150.

[0030] The storage device 120 defines a plurality of slots 144-1, 144-2, 144-3, ... 144-N (collectively slots 144), which are arranged in a generally parallel relationship. Each slot 144 is adapted to receive an optical medium 10 such as a CD, DVD, and optical media having future data formats. As will be described further below, the slots 144 support the optical media in a spaced apart relationship. The slots 144 are preferably spaced apart by a sufficient distance to allow a user to easily grab the optical medium 10 without grabbing or otherwise disturbing the optical media 10 stored in adjacent slots. The body 102 defines an elliptical surface 156 that meets with a groove 158 that receives and guides the optical media 10. In this embodiment, the upwardly facing surface 124 is defined by the body 102 between the slots 144.

[0031] Referring now to FIGs. 11, 12A and 12B, the slots 144 have an upper generally "U"-shaped cavity 160 and a lower trapezoidal-shaped cavity 164. The "U"-shaped cavity 160 has a width that decreases with the depth of the "U"-shaped cavity 160. The "U"-shaped cavity 160 guides the optical media 10 into the lower trapezoidal-shaped cavity 164. The lower trapezoidal-shaped cavity 64 has a width d4 that decreases with the depth of the lower trapezoidal-shaped cavity 164 to a minimum width d3, which is greater than the width of the optical medium 10. In other words, d4 > d3. In one embodiment, side walls of the trapezoidal-shaped cavity 164 form an angle with respect to a line perpendicular to the supporting surface 56 that is greater than 0º and less than 5º. In a preferred embodiment, the angle greater than 0º and less than 1º. The angle is approximately 0.5º in FIGs. 7-10. The dimension d3 is preferably a bit larger than the thickness of the optical media. For example, d3 is between 1.25 and 1.40 mm. The angled sides reduce the likelihood that the optical media 10 will get stuck in the lower trapezoidal-shaped cavity 164. The angled sidewalls also facilitate removal of the storage device 100 from a mold when the storage device is produced. The depth d2 of the lower trapezoidal-shaped cavity 164 is between 8mm and 20mm. In a preferred embodiment, d2 is between 10 and 14mm. In FIGs. 7-10, d2 is 12mm at the center and reduces to zero at the sides. The spacing d1 between adjacent slots 144 is between 10 mm and 20 mm. Preferably, the spacing d1 is 14 mm to 20 mm.

[0032] The storage devices 20 and 100 provide an easy-to-use temporary storage location for optical media 10. The storage devices 20 and 100 protect the optical media 10 as well as eliminate location clutter around the computer desk,

entertainment center and other locations. The optical media 10 is protected until returned to permanent storage devices such as jewel cases, CD albums, etc. The storage device 20 is also ideally suited for staging optical media for the copying and/or software installation. For example, when installing software such as an operating system, the optical media may be lined up in order in successive slots. When copying optical media 10, two storage devices may be used to further simplify the copying process. One storage device 20 is used to hold the blanks and another storage device holds the originals. Using this approach makes it easier to track.

[0033] The storage device is molded from plastic and has a thickness between 1 mm and 3 mm. In a preferred embodiment, the body has a thickness of 2 mm. The plastic material may polycarbonate, acrylic or similar materials. One or more bumpers 180 for example shown in FIG. 4 may extend downwardly from the body to reduce inadvertent sliding of the storage devices 20 and 100. While five and six slots are shown, additional and/or fewer slots may be used. The storage device is designed to minimize contact between the storage devices 20 and 100 and the optical media 10 to reduce scratching. For example and referring to FIG. 13A, the data stored on optical medium starts at the center of the optical medium and can occupy up to the outer 2 mm of radius as shown in FIG. 1. The last 2 mm of radius is the area that the storage device 20 according to the present invention contacts area 200 when the optical media 10 is seated in the slots 44 and 144. As a result, there is a very minimal chance that using the storage devices 20 and 100 will scratch the optical media 10. In FIG. 13B, a contact area 202 corresponding to the storage device 100 in FIGs. 7-10 is shown.

[0034] Those skilled in the art can now appreciate from the foregoing description that the broad teachings of the present invention can be implemented in a variety of forms. Therefore, while this invention has been described in connection with particular examples thereof, the true scope of the invention should not be so limited since other modifications will become apparent to the skilled practitioner upon a study of the drawings, the specification and the following claims.